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Lumbar disc herniation: favourable outcome associated with intake of wine

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Abstract Recent research indicates that non-smoking and intake of alcoholic beverages, in particular wine, are associated with beneficial effects on several diseases, especially atherosclerosis. The aim of the study was to investigate whether smoking or the intake of different alcoholic beverages are associated with the outcome 2½ years after first-time lumbar disc surgery. The design was a follow-up study, using a questionnaire including a rating scale. All 170 patients consecutively operated upon for a lumbar disc herniation over a 1-year period were clinically examined at the time of the operation and classified according to various social and demographic variables. The main outcome measure, 2½ years after, was the total rating score, i.e. the sum of three equally weighted outcome measures: pain, impairment and self-assessment of the operation result. The questionnaires were completed by 148 patients (87%). The median age of patients was 41 years; 60 of them were women. Fifty-four per cent were smokers and 42% wine drinkers. Logistic regression analysis calculated a fourfold increase in the success rate for wine drinkers. This fourfold odds ratio was not significantly reduced by the following variables: age, sex, social class, household income, smoking habits, employment status or marital status. Smoking could not be shown to be an independent risk factor for the outcome. Intake of wine was found to be associated with a good prognosis after first-time lumbar disc surgery, and this association could *not* be attributed to the lifestyle characteristics studied.

Key words Intervertebral disc ·
Disc displacement surgery ·
Socioeconomic factors · Alcohol ·
Alcoholic beverages · Recovery

Introduction

Lumbar disc herniation is a common spinal disorder that in Denmark is operated upon in 0.7% of the general population (4200 operations annually per 5.1 million inhabitants) [1]. Although lumbar disc herniation is only a minor part of the low back pain complex, it has attracted considerable interest in the search for outcome predictors after first-time back surgery. The most common reason for surgery for lumbar disc herniation is the relief of pain [22]. The pain is often complex and requires a multifaceted approach. Relying solely on structural abnormalities is inadequate [2]. The single most striking factor behind a poor outcome of surgery was poor patient selection prior to the initial operative procedure [4]. Many attempts have been made to construct a lumbar disc surgery predictive score card taking into account clinical findings, psychological tests and lifestyle indicators [4, 14, 25].

Studies have shown beneficial effects of wine on conditions as different as ischaemic heart disease, geriatric mental disorders, gallstone formation and oxidation of human low-density lipoprotein [5, 16, 18, 20]. The intake of moderate amounts of alcoholic beverages was associated

with a decreased frequency in hospitalization due to somatic disorders [13]. Smoking, on the other hand, has been shown to be associated with a less favourable prognosis after low back surgery [14].

The aim of the present study was to examine whether smoking or the intake of different alcoholic beverages was associated with the outcome of surgery for first-time lumbar disc herniation.

Methods

The study included 148 of the total of 170 patients consecutively operated upon for lumbar disc herniation over a 1-year period between 5 April 1992 and 5 April 1993. Three patients had undergone previous surgery for lumbar disc herniation, but at a different disc level. Indications for surgery were in agreement with the criteria stated by Spengler and Freeman [22]. Median age was 41 years (range 16–70 years) with 102 being males. Five weeks after the operation, all patients were examined in the hospital's out-patient clinic. In cases of unsatisfactory outcome, the patients were followed up until they recovered or reached status quo and further examinations or therapy were deemed unlikely to be successful. All patients operated upon in that period were included, and virtually none of those for whom surgery was indicated were rejected for operation due to concomitant disease. All patients were operated with a conventional hemilaminectomy and none had a complicated disease such as spinal stenosis. Patients were classified according to various social and demographic variables in relation to the duration of different stages of the lumbar back disease [19]. At a median of 2½ years (range 2–3 years) after the operation for lumbar disc herniation, all 170 patients were sent a questionnaire. The main topics of the questionnaire were additional information about socio-economic characteristics, drinking and smoking habits and finally an assessment of the outcome.

Definitions of variables

Household income. The total annual household income in the year before the onset of actual back disease. For persons living alone, income was adjusted to the income group one step higher. The income groups were as follows: group 1, > 450,000 DKK ($ 66,500); group 2, 350,000–450,000 DKK; group 3, 200,000–350,000 DKK; group 4, < 200,000 DKK.

Marital status. Either living alone or living as a couple (married or not).

Social class. Group 1 represented the highest social group, group 5 the lowest social group. These five categories were supplemented by social group 6, which included all those persons not belonging to any of the above-listed social groups (e.g. the unemployed, pensioners, housewives, persons receiving different sorts of economic compensation) [19].

Employment status (before actual back disease). Employed was used to mean at work or only temporarily unemployed due to weather or seasonal conditions, unemployed meant no fixed connection to the labour market.

Drinking habits. Patients could state abstention or specify the principal source of alcoholic beverage (beer, wine or spirits). No questions concerning the amount of alcohol were asked. Secondary to this classification, they were divided into two groups: wine drinkers (intake of either wine alone or wine and beer) and non-wine drinkers (abstainers and beer drinkers).

Smoking habits. Patients were classified as smokers or non-smokers. No questions concerning the amount or type of tobacco were asked.

Age. Age at time of operation.

Definition of main outcome measure

Total rating score

The main outcome measure was the total rating score, defined as the sum of three equally weighted outcome measures: pain + impairment + self-assessment. The best possible score was 3, the worst score 12.

Pain

The patients were asked how often they experienced low back pain or sciatica as a problem. Responses were graded as grade 1: rarely, never; grade 2: now and then; grade 3: frequently; grade 4: always.

Impairment

The patients were asked how often low back pain or sciatica hampered their daily activities and/or work: grade 1: rarely, never; grade 2: now and then; grade 3: frequently; grade 4: always.

Self-assessment

The patients were asked how they themselves judged the result of the operation for lumbar disc herniation: grade 1: good; grade 2: fair; grade 3: don't know; grade 4: bad.

Statistics

For binary interventions (smoking, employment, marital status, intake of wine) outcomes (total scores) were compared by means of the Mann-Whitney test. For groups of interventions (intake of different types of alcohol) the Kruskall-Wallis test was used. For interventions with a known rank (social and income groups) the Jonckheere-Terpstra test was used. The Spearman test was used for the continuous variable, age. For all tests a 5% significance level was used [27]. Multiple logistic regression was used to test for potential confounding variables [23]. Due to the relatively small number of subjects, the household income variable was transformed to "high" (groups 1 and 2) and "low" (groups 3 and 4). The social groups were similary transformed to "high" (groups 1 and 2) and "low" (groups 3, 4, 5 and 6). Alcohol consumption was divided into wine and non-wine drinkers. The cumulative risk of a favourable result, arbitrarily defined as a total rating score from 3 to 7, was estimated with odds ratios and 95% confidence intervals.

Table 1 Comparison of patients' self-rating across the three components of the main outcome measure, where grade 1 represents the best outcome and grade 4 the worst

Outcome measure	Patients' self-rating				
	Grade 1	Grade 2	Grade 3	Grade 4	Unknown
Pain	34	53	27	33	1
Impairment	46	53	19	27	3
Self-assessment	79	36	13	18	2

Table 2 The main outcome measure exposed to different variables, arranged so that the most favorable variable for outcome is listed first (*MW* Mann-Whitney, *S* Spearman, *JT* Jonckheere-Terpstra, *KW* Kruskall-Wallis)

Variables	Outcome measure	Statistical analysis	Result
Age	Total rating score	S	$P = 0.04$ $z' = 2.10$
Male/female	Total rating score	MW	$P = 0.76$
Married/single	Total rating score	MW	$P = 0.74$
Employed/unemployed	Total rating score	MW	$P = 0.02$
Social class (1–6)	Total rating score	JT	$P = 0.04$
Household income (1–4)	Total rating score	JT	$P = 0.04$
Non-smoking/smoking	Total rating score	MW	$P = 0.03$
Wine/wine + beer/beer/abstain	Total rating score	KW	$P = 0.002$
Wine/no wine	Total rating score	MW	$P = 0.0005$ Median diff. –2 Confidence int. –1 to –3

Results

A total of 148 patients (87%) completed the questionnaire. Those who completed the questionnaire did not differ from the 22 patients (13%) who did not, with regard to age, sex and short-term outcome. Eighty-eight responders were men and 60 women. Median age at the time of operation was 41 years (range 16–70 years). Twenty-six lived alone whereas 120 lived with a partner. Ten (7%) had a later, additional, low back operation. One hundred and nine (74%) were employed before the operation and 88 (60%) were employed at the time of filling in the questionnaire. The patients' outcome ratings are quoted in Table 1. Eighty (54%) were smokers and 68 (46%) non-smokers. Favourite beverages were: beer 46 (31%), wine 48 (33%), both wine and beer 14 (10%), and finally 37 (25%) were abstainers. Only two patients stated spirits as their favourite beverage and were therefore excluded. The univariate statistical evaluation of the outcome measure exposed to the variables is shown in Table 2. Further analysis of the different type of alcohol consumption in relation to outcome showed that a favourable outcome was associated with either wine drinking alone or wine and beer. The logistic regression analysis represents a model with all parameters included. Several models were made using fewer variables, but these reduced models did

Table 3 Logistic regression analysis with outcome as the dependent variable. Odds ratio denotes the cumulative risk of a favourable result, i.e. total rating score between 3 and 7

Predictor Variable	Odds ratio (95% Confidence intervals)
Age (Continuous variable)	0.97 (0.93– 1.01)
Married/single	0.63 (0.20– 1.93)
Employed/unemployed	1.60 (0.61– 4.16)
Social group: high/low	2.12 (0.22–20.46)
Household income: high/low	1.11 (0.46– 2.66)
Wine drinking/non-wine drinking	4.24 (1.65–10.89)
Smoking/non-smoking	0.50 (0.22– 1.14)

Table 4 Distribution of outcome measure (total rating score) by category of drinker

Total Rating score	Beer	Abstain	Beer and wine	Wine	Spirits	Unknown
3	9	4	4	15	1	
4	6	1		4		
5	4	4	2	11	1	1
6	5	5	4	2		
7	5	2	2	6		
8	4	5		2		
9	2	6		3		
10	3	2	1	2		
11	2	2		1		
12	5	5		1		
Unknown	1	1	1	1		
SUM	46	37	14	48	2	1

not reveal further information. In all the models tested, wine consumption was associated with an odds ratio of approximately 4 for a favourable result. None of the tested models revealed smoking as a significant predictive variable when adjusted for the effect of wine drinking, although a trend for unfavourable outcome was seen in smokers. The results of the logistic regression analysis are shown in Table 3. The distribution of the outcome measure by category of drinker is shown in Table 4.

Discussion

The results indicated that intake of wine, but not other types of alcohol, was associated with a fourfold increased "risk" of a good prognosis after first-time low back surgery. This increase in success rate was not reduced after adjustment for age, sex, social class, employment status, household income, marital status or smoking habits.

A list of criteria for the evaluation of results in lumbar spine surgery has been proposed [17]. The criteria for pa-

tient selection should always be clearly given: at least 2 years should have elapsed since the operation and the number of subjects followed must exceed 80% of the included consecutive, original patients. The doctors' clinical examination rating should not be performed by the surgeon himself and the unretrieved patients should not deviate from those included in the study [3]. These criteria were fulfilled here, as the included patients were comparable to the consecutive, original patients previously studied [19].

An important point for this type of study is how to measure objectively the result of a treatment given to relieve the patients subjective pain. The validity of a questionnaire, as opposed to a personally conducted clinical examination, to measure the outcome after first-time low back surgery has been studied extensively and the results indicate that a questionnaire may be a reliable tool [15]. However, questionnaire design has been shown to have an important effect on the determination of end results in lumbar spinal surgery [11]. This effect of questionnaire design may be important when comparing results of surgery between different groups of patients examined by non-uniform methods. Since all the patients in the present study were examined by the same method, the exact questionnaire design was less important. This is in agreement with the actual findings, as the association between intake of wine and good prognosis could be found in each of the three outcome measure components (pain, impairment, self-assessment) as well as in the sum of them (total rating score). Whatever the type of assessment performed, the reported outcome may tend to represent the patients' actual status rather than any change produced by surgery, thus making the interpretation of the results even more complex [26]. The total score ranges 3–7 (defined as "success" with $n = 98$) and 8–12 (defined as "failure" with $n = 46$) were chosen because they represent the two equal halfparts of the outcome measure, and the patients had to be divided in two groups that were not too uneven for the statistical analysis.

Information about drinking habits was not obtained until 2½ years after the operation; however, drinking habits are known from other studies to be stable within a range of at least 4–6 years. The study only included surgically treated patients with lumbar disc herniation and there was no control group treated conservatively.

The trend towards a less favourable prognosis in smokers after lumbar disc surgery is consistent with the results of other studies [14]. The adverse effect of tobacco on the outcome after discectomy has been widely attributed to biological mechanisms such as diminished mineral content leading to microfractures of the trabeculae in the vertebral bodies as well as reduction of the vertebral blood flow [6, 8, 24].

The effect of different sorts of alcoholic beverages on the outcome after lumbar discectomy has never, to my knowledge, been studied before. The patients were not asked about the amount of consumption, because the reported alcohol consumption is known to vary with the type of alcohol consumed and is generally assessed too low and very inaccurately. The suggested good prognosis associated with intake of wine might have been interpreted as wine being an innocent indicator in patients with an otherwise healthy lifestyle. This important point was therefore examined by additional statistical analysis taking into account different lifestyle characteristics thought to be pertinent. However, this logistic regression analysis could not attribute the beneficial effect of wine to any of the examined lifestyle characteristics (Table 3). No matter which of the lifestyle indicators were examined, intake of wine was associated with a fourfold increased rate of success both for the total rating score as well as for each of its three components.

Low back pain and lumbar disc degeneration have recently been attributed to atherosclerosis of the abdominal aorta, the so-called lumbar-artery hypothesis [12]. The basis for this hypothesis was the segmental blood supply to the lumbar segments and the demonstration of an association between lumbar artery stenosis and both lumbar disc degeneration and low back pain. In another study it was found that only wine drinking could clearly reduce the risk of dying from both cardiovascular and cerebrovascular diseases and the risk of dying from other causes. This protective effect of wine could not be ascribed to social class variables [7]. A significant inverse correlation was obtained between mortality due to ischaemic disease and percentage contribution to alcoholic consumption of wine [18]. Alcohol seems to protect against harmful effects of low-density lipoprotein and increase the concentrations of beneficial high-density lipoprotein cholesterol [9].

It has been proposed that several biologically active compounds exert protective effects against atherosclerosis [10, 21]. Wine may therefore, as a working hypothesis, contain such compounds, which are able to reduce lumbar artery stenosis due to atherosclerosis and in this way improve the metabolic status of the intervertebral disc and the surrounding structures [12]. Correspondingly, deteriorated metabolic status of the intervertebral disc and surrounding structures may also explain the trend towards the adverse effect of tobacco on the outcome after lumbar disc surgery. Other hypothetical explanations for the statistical association between intake of wine and good prognosis after discectomy may be an unexplained improvement in coping with pain and impairment, or perhaps an increased pain threshold level in wine drinkers.

In conclusion, intake of wine was found to be strongly associated with a good prognosis after first-time lumbar disc surgery. Further research is needed to explain a biological or behavioural mechanism behind the suggested beneficial effect of wine on the result of low back surgery.

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